

Seqⁿ & Prog $\rightarrow$ DPP 1

1
2
3
4
5

$$\text{Let } a_1 = b_1 = c_1 = a$$

$$\frac{a}{d_1} = \frac{2b}{d_2} \Rightarrow \frac{d_2}{d_1} = 2 \Rightarrow \boxed{d_2 = 2d_1} \quad \frac{a}{d_1} = \frac{3c}{d_3} \Rightarrow \boxed{d_3 = 3d_1}$$

$$\frac{a_7}{c_6} = \frac{a+6d_1}{a+5d_3} = \frac{a+6d_1}{a+15d_1} = \frac{3}{7} \Rightarrow 7a+42d_1 = 3a+45d_1$$

$$\boxed{4a = 3d_1}$$

$$\frac{b_7}{c_6} = \frac{a+6d_2}{a+5d_3}$$

$$= \frac{a+12d_1}{a+15d_1} = \frac{\frac{3d_1}{4} + 12d_1}{\frac{3d_1}{4} + 15d_1} = \frac{17}{21}$$

3)

no. of Sides of Poly = n

$$159 + (n-1)d = 177^\circ$$

$$(n-1)d = 18^\circ$$

Sum of Int. = $(n-2) \times \pi$

$$159 + (159 + d) + (159 + 2d) - \dots + (159 + (n-1)d) = (n-2)180^\circ$$

$$159n + d(1+2+3+\dots+(n-1)) = (n-2)180^\circ$$

$$159n + d \frac{(n-1)(n)}{2} = (n-2)180^\circ$$

$$\frac{19}{27}$$

$$(2) \quad \frac{n}{2} (159^\circ + 177^\circ) = (n-2)180^\circ$$

$$15 \times (346^\circ) = 28 \times 180^\circ$$

$$4) \quad ax^2+bx+c=0 \Leftrightarrow \alpha, \beta \quad px^2+qx+r=0 \Leftrightarrow \gamma, \delta$$

$$\alpha+\beta=-\frac{b}{a}, \quad \alpha\beta=\frac{c}{a} \quad \Bigg| \quad \gamma+\delta=-\frac{q}{p}, \quad \gamma\delta=\frac{r}{p}$$

$$\alpha, \beta, \gamma, \delta \in \mathbb{R}^p$$

$$\beta-\alpha = \delta-\gamma \quad \Rightarrow \quad (\beta-\alpha)^2 = (\delta-\gamma)^2$$

$$(\alpha+\beta)^2 - 4\alpha\beta = (\gamma+\delta)^2 - 4\gamma\delta$$

$$\frac{b^2}{a^2} - \frac{4c}{a} = \frac{q^2}{p^2} - \frac{4r}{p}$$

$$\frac{p_1}{a^2} - \frac{p_2}{p} = \frac{p_1}{p^2} - \frac{a^2}{p^2}$$

7, 8, 9,

$$\underline{1, \log_4 x, \log_2 y, -15 \log_x z}$$

$$\log_4 x = 1 + d$$

$$\log_2 y = 1 + 2d$$

$$-15 \log_x z = 1 + 3d$$

7) $a_1, a_2, \dots$ $b_1, b_2, \dots$ 10, 11, 12

11) Positive IWA.

12) p & q be Roots

$$Q12 \quad x^2 - 2x + A = 0 \begin{cases} \rightarrow p \\ \rightarrow q \end{cases} \quad | \quad x^2 - 18x + B = 0 \begin{cases} \rightarrow r \\ \rightarrow s \end{cases}$$

$$p < q, r < s \rightarrow AP$$

$$\begin{aligned} p + q &= 2 \\ p \cdot q &= A \\ q &= p + d \\ r &= p + 2d \\ s &= p + 3d \end{aligned}$$

$$\begin{aligned} p + p + d &= 2 \\ 2p + d &= 2 \\ p &= -1 \end{aligned}$$

$$\begin{aligned} r + s &= 18 \\ r \cdot s &= B \\ 2p + 5d &= 18 \\ 2p + d &= 2 \\ \hline 4d &= 16 \\ d &= 4 \end{aligned}$$

$r =$

$$11) \quad a_1 = 10, \quad a_{a_2} = 100$$

$$\begin{array}{l|l} a_2 = 10 + d \\ a_3 = 10 + 2d \end{array} \quad \left| \quad \begin{array}{l} a_{a_2} = a_1 + (a_2 - 1)d = 100 \\ = a_1 + (10 + d - 1)d = 100 \end{array} \right.$$

$$\begin{aligned} a_3 &= 10 + 12 \\ &= 22 \\ &\textcircled{B} \times \end{aligned}$$

$$10 + (9 + d)d = 100$$

$$(9 + d)d = 90$$

$$d^2 + 9d - 90 = 0$$

$$(d + 15)(d - 6) = 0$$

$$\boxed{d = 6} \quad (*)$$

$$\boxed{C} \quad a_{\boxed{22}} = \boxed{a_{a_3}} \boxed{D} \times$$

$$= a_1 + 21d$$

$$= 10 + 21 \times 6$$

$$= 136 \quad \boxed{C} \checkmark$$

DPP 21
2
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4
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$$t_5 = 16t_5 \quad \Rightarrow \quad r^6 = 16 \times r^{10} \Rightarrow r^4 = \frac{1}{16} \Rightarrow r^2 = \frac{1}{4}$$

$$S_{\infty} = \frac{r^2}{1-r^2} = \frac{\frac{1}{4}}{1-\frac{1}{4}} = \frac{1}{3}$$

Q3

$$4T_{n+1} = T_n$$

$$r = \frac{T_{n+1}}{T_n} = \frac{1}{4}$$

$$T_{n+1} = \frac{T_n}{4}$$

$$T_5 = \frac{1}{2560}$$

$$a \cdot \left(\frac{1}{4}\right)^4 = \frac{1}{2560}$$

DI

$$a \times \frac{1}{256} = \frac{1}{2560}$$

$$a = \frac{1}{10}$$

$$\sum T_n \cdot T_{n+1} = \sum \frac{T_n^2}{4}$$

$$= \frac{1}{4} \sum T_n^2$$

$$\frac{1}{4} \{ T_1^2 + T_2^2 + \dots \}$$

$$4) \quad 1, \boxed{r}, r^2, r^3, \dots \text{ GP.}$$

$$y = 4a_2 + 5a_3$$

$$y = 4r + 5r^2$$

$$\frac{dy}{dr} = 4 + 10r = 0$$

$$S_{\infty} = \frac{1}{1 + \frac{2}{5}} = \frac{5}{7}$$

$$r = -\frac{2}{5}$$

$$5) \quad \frac{a r^5}{a r^5} = \frac{1}{4} \Rightarrow r^2 = 4 \Rightarrow r = \pm 2$$

$$b_1 = 12$$

$$r = 2$$

$$b_2 + b_5 = 216$$

$$ar + ar^4 = 216$$

$$2a + a \cdot 16 = 216$$

$$18a = 216$$

$$a = \frac{216}{18} = \frac{36}{3} = 12$$

$$7) \quad x^3 + px^2 + qx + 1 = 0 \quad \left(\begin{matrix} \frac{q}{r} \\ q \\ ar \end{matrix} \right) = 0, \quad a^3 = 1 \quad \boxed{a=1} \Rightarrow \boxed{C} \checkmark$$

$$\left(\frac{1}{r} \right), 1, r \quad \boxed{r} \rightarrow r > 1$$

$\frac{1}{r} < 1$ $\uparrow$ GP

$\boxed{D}$

$$\begin{array}{l|l} \frac{q}{r} + a + ar = -p & \frac{1}{r} + r + 1 = q \\ \frac{1}{r} + 1 + r = -p & \downarrow \\ & -p = q \\ & \therefore -p + q > 0 \quad \boxed{A} \checkmark \end{array}$$

Q9.

$$\frac{S_{3n}}{S_{2n}-S_n}$$

$$S_{2n}-S_n = \frac{2n}{2} [2a + (2n-1)d]$$

$$S_{2n} = \frac{n}{2} [4a + (4n-2)d]$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_{2n}-S_n = \frac{\frac{3n}{2} [2a + (3n-1)d]}{3} = \frac{S_{3n}}{3}$$

$$3 \therefore \frac{S_{3n}}{S_{2n}-S_n}$$

$$\sum a_i = 1064$$

$$a_6 = 4a_4$$

$$a_9 - a_7 = 192$$

$$ar^5 = 4ar^3$$

$$ar^8 - ar^6 = 192$$

$$r^2 = 4$$

$$r = 2$$

$$256a - 64a = 192$$

$$192a = 192$$

$$a = 1$$

$$\sum_{i=4}^n a_i = \underbrace{(a_1 + a_2 + \dots + a_n)} - (a_1 + a_2 + a_3)$$

$$1 \cdot \frac{(2^n - 1)}{2 - 1} - 1 \cdot \frac{(2^3 - 1)}{2 - 1} = 1064$$

$$g(1) \rightarrow g_n \rightarrow$$

$$g_{200} = ar^{199}$$

$$\sum_{n=1}^{100} g_{2n} = \frac{10}{3} \quad \bigg| \quad \sum_{n=1}^{100} g_{2n+1} = \frac{5}{3}$$

$$ar + ar^3 + ar^5 \dots ar^{199} = \frac{10}{3}$$

$$a + ar^2 + ar^4 \dots + ar^{198} = \frac{5}{3}$$

$$\frac{r(a + ar^2 + ar^4 \dots + ar^{198})}{a + ar^2 + ar^4 \dots + ar^{198}} = \frac{\frac{10}{3}r}{\frac{5}{3}} = \frac{10}{5} \times \frac{r}{1} = 2r = 6$$

$$\prod_{m=1}^6 \left(\sec \left(\theta + \frac{(m+1)\pi}{4} \right) \cdot \sec \left(\theta + \frac{m\pi}{4} \right) \right) = 4\sqrt{2}$$

$\theta \in (0, \frac{\pi}{2})$ find θ :- ?

$$\sum \frac{1}{\sin \left(\theta + \frac{m\pi}{4} \right) \cdot \sin \left(\theta + \frac{(m-1)\pi}{4} \right)} \times \frac{\sin \frac{\pi}{4}}{\frac{\pi}{4}}$$

$$\sqrt{2} \sum \frac{\sin \left\{ \left(\theta + \frac{m\pi}{4} \right) - \left(\theta + \frac{(m-1)\pi}{4} \right) \right\}}{\sin \left(\theta + \frac{m\pi}{4} \right) \cdot \sin \left(\theta + \frac{(m-1)\pi}{4} \right)}$$

$$\sqrt{2} \sum \frac{\sin \left(\theta + \frac{m\pi}{4} \right) \cdot \cos \left(\theta + \frac{(m-1)\pi}{4} \right) - \cos \left(\theta + \frac{m\pi}{4} \right) \cdot \sin \left(\theta + \frac{(m-1)\pi}{4} \right)}{\sin \left(\theta + \frac{m\pi}{4} \right) \cdot \sin \left(\theta + \frac{(m-1)\pi}{4} \right)}$$

$$\sqrt{2} \sum_{m=1}^6 \left(\cot \left(\theta + \frac{(m-1)\pi}{4} \right) - \cot \left(\theta + \frac{m\pi}{4} \right) \right)$$

$$\text{diff} = \left(\theta + \frac{m\pi}{4} \right) - \left(\theta + \frac{(m-1)\pi}{4} \right) = \frac{\pi}{4}$$

$$\sqrt{2} \left\{ \begin{aligned} & \cot \theta - \cot \left(\theta + \frac{\pi}{4} \right) \\ & + \cot \left(\theta + \frac{\pi}{4} \right) - \cot \left(\theta + \frac{2\pi}{4} \right) \\ & + \cot \left(\theta + \frac{2\pi}{4} \right) - \cot \left(\theta + \frac{3\pi}{4} \right) \\ & \vdots \\ & + \cot \left(\theta + \frac{5\pi}{4} \right) - \cot \left(\theta + \frac{6\pi}{4} \right) \end{aligned} \right\} = \sqrt{2} \left(\cot \theta - \cot \left(\theta + \frac{3\pi}{2} \right) \right)$$

$$\sqrt{2} \left(\cot \theta + \tan \theta \right) = 4\sqrt{2} \quad (\text{given}) \Rightarrow \tan \theta + \frac{1}{\tan \theta} = 4$$

$$\tan^2 \theta - 4 \tan \theta + 1 = 0$$

$$\tan \theta = \frac{4 \pm \sqrt{12}}{2} = 2 \pm \sqrt{3}$$

$$\tan \theta = 2 - \sqrt{3}$$

$$\tan \theta = \tan 15^\circ$$

$$\theta = 15^\circ$$

$$\tan \theta = 2 + \sqrt{3}$$

$$= \tan 75^\circ$$

$$\theta = 75^\circ$$

$a \sin \theta + b \cos \theta$ type Qs.

Method: SAA

Q If $a \sin \theta + b \cos \theta = 3$

$\Rightarrow a \sin \theta - b \cos \theta = 4$ for $a^2 + b^2 = 25$

$$a^2 \cos^2 \theta + b^2 \sin^2 \theta + 2ab \sin \theta \cos \theta = 9$$

$$a^2 \sin^2 \theta + b^2 \cos^2 \theta - 2ab \sin \theta \cos \theta = 16$$

$$a^2 (\sin^2 \theta + \cos^2 \theta) + b^2 (\sin^2 \theta + \cos^2 \theta) = 25$$

$$a^2 + b^2 = 25$$

Q If $\cos x + \sin x = \sqrt{2} \cos x$ then.

P.T. $\cos x - \sin x = \sqrt{2} \sin x$

$(\cos x + \sin x) = \sqrt{2} \cos x$ Sq^r

$$\cos^2 x + \sin^2 x + 2 \sin x \cos x = 2 \cos^2 x$$

$$\cos^2 x - \sin^2 x - 2 \sin x \cos x = 0 \quad + 2 \sin^2 x$$

$$\cos^2 x + \sin^2 x - 2 \sin x \cos x = 2 \sin^2 x$$

$$(\cos x - \sin x)^2 = (2 \sin x)^2$$

$$\cos x - \sin x = \sqrt{2} \sin x$$

Q If $3 \sin x + 4 \cos x = 5$ then find value of $\frac{4 \sin x - 3 \cos x}{}$

Solⁿ $3 \sin x + 4 \cos x = 5$

$$9 \sin^2 x + 16 \cos^2 x + 24 \sin x \cos x = 25$$

$$9(1 - \cos^2 x) + 16(1 - \sin^2 x) + 24 \sin x \cos x = 25$$

$$9 - 9 \cos^2 x + 16 - 16 \sin^2 x + 24 \sin x \cos x = 25$$

$$9 \cos^2 x + 16 \sin^2 x - 24 \sin x \cos x = 0$$

$$(3 \cos x - 4 \sin x)^2 = 0$$

$$3 \cos x - 4 \sin x = 0$$

Set 2

$$1) \tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \cdot \tan B}$$

$$2) \tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

$$3) \cot(A+B) = \frac{\cot A \cdot \cot B - 1}{\cot A + \cot B}$$

$$4) \cot(A-B) = \frac{\cot A \cdot \cot B + 1}{\cot B - \cot A}$$

$$(5) \tan\left(\frac{\pi}{4} + A\right) = \frac{1 + \tan A}{1 - \tan A}$$

$$(6) \sin(A+B) \cdot \sin(A-B) = \sin^2 A - \sin^2 B \leftarrow \text{Major} \\ = \cos^2 B - \cos^2 A$$

$$(7) \frac{\cos(A+B) \cdot \cos(A-B)}{\downarrow} = \cos^2 A - \sin^2 B \\ = \cos^2 B - \sin^2 A \\ (\cos A \cos B - \sin A \sin B) \times (\cos A \cos B + \sin A \sin B) \\ \cos^2 A \cdot \cos^2 B - \sin^2 A \cdot \sin^2 B \\ (\cos^2 A \cdot (1 - \sin^2 B) - (1 - \cos^2 A) \cdot \sin^2 B) \\ \cos^2 A - \cancel{\cos^2 A \cdot \sin^2 B} - \sin^2 B + \cancel{\cos^2 A \cdot \sin^2 B} \\ \cos^2 A - \sin^2 B$$

$$(8) \text{ If } \frac{\tan A}{\tan B} = \frac{x}{y} \text{ (given)}$$

$$\frac{\sin A \cos B}{\cos A \sin B} = \frac{x}{y} \quad ((\&D))$$

$$\frac{\sin A \cos B + \cos A \sin B}{\sin A \cos B - \cos A \sin B} = \frac{x+y}{x-y}$$

$$\boxed{\frac{\sin(A+B)}{\sin(A-B)} = \frac{x+y}{x-y}}$$

(9) Multiple & Sub Multiple Angle

Multiple θ	Sub Multiple
2θ	$\theta/2$
3θ	$\theta/3$
4θ	$\theta/4$
$\vdots$	$\vdots$

$$1) \sin 2A = 2 \sin A \cos A$$

$$2) \cos 2A = \cos^2 A - \sin^2 A$$

$$\begin{aligned} \cos 2A &= 2 \cos^2 A - 1 \\ &= 1 - 2 \sin^2 A \end{aligned}$$

$$(3) \tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

$$(4) \sec 2A = \frac{2 \tan A}{1 + \tan^2 A}$$

$$(5) \csc 2A = \frac{1 - \tan^2 A}{1 + \tan^2 A}$$

$$(6) 1 + \cos 2A = 2 \cos^2 A$$

$$7) 1 - \cos 2A = 2 \sin^2 A$$

$$(8) (1 + \sin 2A) = (\cos A + \sin A)^2$$

$$(9) (1 - \sin 2A) = (\cos A - \sin A)^2$$

$$Q \quad \frac{\sin 2A}{1 - \cos 2A} = ?$$

$$\frac{2 \sin A \cos A}{2 \sin^2 A} = \cot A$$

$$Q \quad \frac{1 + \cos 2A}{1 - \cos 2A} = ?$$

$$\frac{2 \cos^2 A}{2 \sin^2 A} = \cot^2 A$$

$$Q \quad \frac{\sin A}{1 + \cos A} = ? \Rightarrow \frac{2 \sin \frac{A}{2} \cos \frac{A}{2}}{2 \cos^2 \frac{A}{2}} = \tan \frac{A}{2}$$

$$Q. \quad \frac{\sin^2 A - \sin^2 B}{\sin A \cos A - \sin B \cos B}$$

$$\frac{\sin(A+B) \cdot \sin(A-B)}{2 \sin A \cos A - 2 \sin B \cos B} \times 2$$

$$\frac{2 \sin(A+B) \sin(A-B)}{\sin 2A - \sin 2B}$$

$$\frac{2 \sin(A+B) \cdot \sin(A-B)}{2 \cos(A+B) \cdot \sin(A-B)}$$

$$\begin{aligned} \sin(-\sin B) \\ = 2 \cos(\quad) \cdot \sin(\quad) \end{aligned}$$

$$= \tan(A+B)$$

10) Set 3 formulae.50%.Sum & Difference of Sin/Cos $\rightarrow$ Prod.

$$\begin{aligned}
 1) \sin C + \sin D &= 2 \sin \left(\frac{C+D}{2} \right) \cos \left(\frac{C-D}{2} \right) \\
 2) \sin C - \sin D &= 2 \cos \left(\frac{C+D}{2} \right) \sin \left(\frac{C-D}{2} \right) \\
 3) \cos C + \cos D &= 2 \cos \left(\frac{C+D}{2} \right) \cos \left(\frac{C-D}{2} \right) \\
 4) \cos C - \cos D &= -2 \sin \left(\frac{C+D}{2} \right) \sin \left(\frac{C-D}{2} \right)
 \end{aligned}$$

Prod $\rightarrow$ Sum / Difference.

$$\begin{aligned}
 2 \sin A \cos B &= \sin(A+B) + \sin(A-B) \\
 2 \cos A \sin B &= \sin(A+B) - \sin(A-B) \\
 2 \cos A \cos B &= \cos(A+B) + \cos(A-B) \\
 2 \sin A \sin B &= \cos(A-B) - \cos(A+B)
 \end{aligned}$$

$$\begin{aligned}
 Q \quad \frac{\sin 30^\circ - \sin 50^\circ}{\cos 30^\circ + \cos 50^\circ} &= \frac{2 \cancel{\cos \frac{30^\circ + 50^\circ}{2}} \sin \left(\frac{30^\circ - 50^\circ}{2} \right)}{2 \cancel{\cos \frac{30^\circ + 50^\circ}{2}} \cos \left(\frac{30^\circ - 50^\circ}{2} \right)} = \frac{\sin(-10^\circ)}{\cos(+10^\circ)} = -\tan 10^\circ
 \end{aligned}$$

11) 30

$$\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$$

$$\cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$$

$$\tan 3\theta = \frac{3 \tan \theta - \tan^3 \theta}{1 - 3 \tan^2 \theta}$$